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# • TORPEDO *Ultra*: Unified Searching of Locally Mounted and Web-based Journals



NASIG 14th Annual Conference  
June 11, 1999

Laurie E. Stackpole  
Naval Research Laboratory

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• *Putting Today's Issue in Context*

## Status of Digital Journal Access

End users need journal information

- appearing in many journals
- published by a variety of publishers
- available from distributed Web sites
- searchable with different protocols

Libraries (and vendors) facilitate access by

- linking from journals to publisher Web sites
- linking from databases to journal articles
- providing users with a common search interface

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## *Unified Searching of Web Journals*

# Framework for Discussing the Issue

- The Naval Research Laboratory
  - Who we are
  - Digital Library Infrastructure
- Providing links to local and remote Web journals from
  - InfoWeb
  - Citation Database
  - Web OPAC
  - E-mail alerting service
- TORPEDO *Ultra* for access to local journals
  - Background and overview
  - Browsing and searching
  - Advantages and challenges
- An approach to unified searching of local and remote journals
- TORPEDO *Ultra* Demonstration

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•     *The Navy's Corporate Research Capability*  
•     Naval Research Laboratory Environment

Main Campus - Washington, D.C.

3,000 Federal Employees [1,500 Scientists & Engineers]

1,000 On-site contractors

130-acre Campus   116 Buildings

Subject Focus

Physics, Chemistry, Electronics, Space Sciences

Other Locations

NRL - Stennis, MS

NRL - Monterey, CA

Parent Organization

Office of Naval Research, Arlington, VA

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## Paving the Way for Digital Journal Access

- 1989    Prototype Research Reports Imaging System
- 1991    InfoNet Campus-wide Information System
- 1992    Production Research Reports Imaging System
- 1993    Third-generation online library catalog - STILAS
- 1994    Dial-in access to the InfoNet
- 1995    TORPEDO for APS journals and NRL reports
- 1995    InfoWeb Information System and Gateway
- 1996    InfoVision/2000 Study Team recommended that  
Library provide all digital services via the WWW  
Increased NRL Web access to digital journals

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<http://infoweb.nrl.navy.mil>

# InfoWeb Information System and Gateway

 The Ruth H. Hooker Research Library  
and Technical Information Center

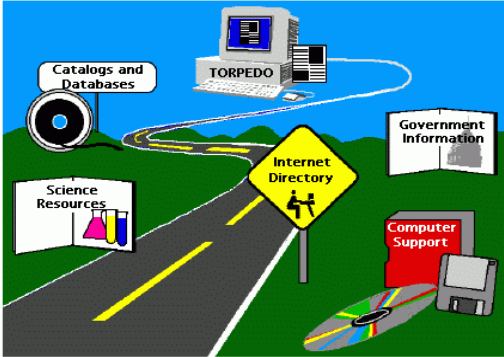
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**InfoWeb**  
Welcome to the Home Page of the Ruth H. Hooker [Research Library and Technical Information Center](#) of the Naval Research Laboratory.

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**Quick Clicks**  
[Library Catalog](#) | [Science Citation Index Expanded](#) | [OCLC First Search](#) |  
[INSPEC for Physics, Electronics, Computing](#) | [InfoWeb Travel](#) | [Material Safety Data Sheets](#) |  
[Electronic Journals on Publisher Web Sites](#) | [Contents-to-go](#) | [What's New...in the Library](#)





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• <a href="#">Catalogs and Databases</a>	• <a href="#">Internet Directory</a>
• <a href="#">Computer Support</a>	• <a href="#">Science Resources</a>
• <a href="#">Government Information</a>	• <a href="#">TORPEDO</a>

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[NRL](#) | [Suggest](#) | [Search](#) | [Gold Key](#)

[webmaster@library.nrl.navy.mil](mailto:webmaster@library.nrl.navy.mil)  
Updated: 9-Feb-1999  
Maintained by: [Leon Fayer](#)

Single point of entry to

- Library info and services
- Databases and publications
- Reviewed Web sites

- Computer Support
- Government Information
- Internet Directories
- Science Resources

- TORPEDO *Ultra* Digital Library Initiative

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## Links to Journals from InfoWeb

### Electronic Journals on Publisher Web Sites

- Journals listed alphabetically
- Clicking on title connects to journal (or site)
- Journals are digital equivalent of print
  - Full text
  - Within collection scope
- Journals are licensed for site use

### Examples:

- *Science* - *Jane's Defence Weekly*
- 300+ journals published by
  - American Chemical Society
  - Assoc. of Computing Machinery
  - Institute of Physics
  - Optical Soc. of America
  - SIAM
  - Springer-Verlag

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## Links to Journals from Library's OPAC

- Hyperlinks from STILAS WebCat journal records to 220 locally mounted journals
  - Persistent URLs have been added to 856 field
  - Link connects to journal in TORPEDO *Ultra*

No links to remote journals YET

- Uncertain nature of “free” access
- Instability of access even with signed agreement
- Cannot always link to specific journal

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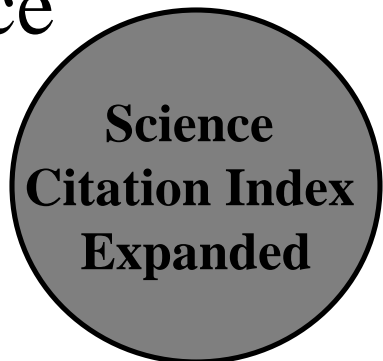
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• *First Step Beyond Linking to Web Journals*  
Using Databases for Retrieving Full Text

- Databases are the established way to search across the journals of many publishers
- Traditionally they serve as pointers to information, e.g. provide a journal citation
- Adding URLs to bibliographic records enables users to retrieve full text article
- Approach favored by many journal aggregators, database vendors, libraries

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## Science Citation Index Expanded

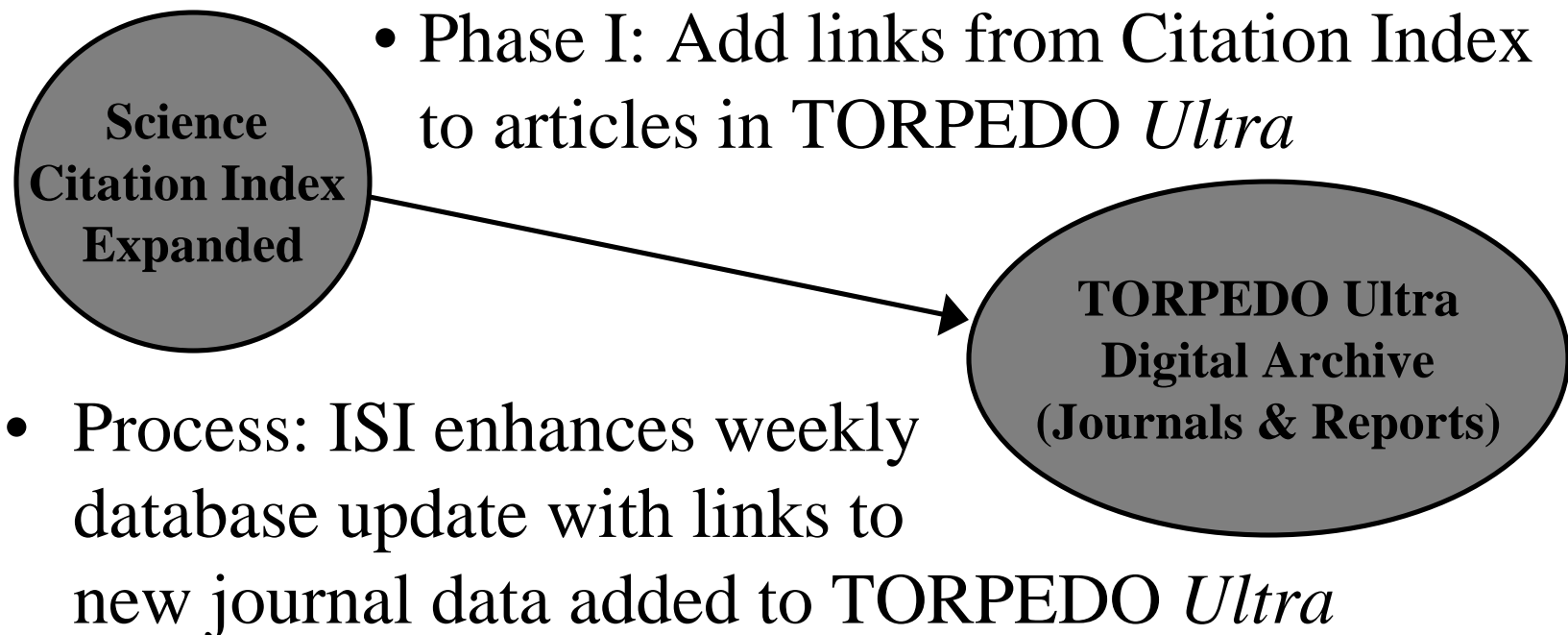
- “Web of Science” Science Citation Index Expanded database mounted locally at NRL
- Jointly licensed by four members of National Research Library Alliance
- 1985 to present available to all
- Back files to 1972 being loaded for selective access
- Members: NASA GSFC, NIST, NSF, NRL



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- Content-enabling a Commercial Database

## Citation Database Links to Full Articles

- NRL-Institute for Scientific Information joint project
- Goal: To enhance capabilities of both Science Citation Index Expanded and TOREPDO *Ultra*



ISI Institute for Scientific Information® CITATION DATABASES

HOME HELP GENERAL SEARCH CITED REF. SEARCH MARK LOG OFF

### General Search Results--Full Record

Article 96 of 1288 [PREVIOUS](#) [NEXT](#) [SUMMARY](#) [HOLDINGS](#) [RELATED RECORDS](#) [FULL TEXT](#)

**Ozone generation by indoor, electrostatic air cleaners**  
Boelter KJ, Davidson JH  
AEROSOL SCIENCE AND TECHNOLOGY  
27: (6) 689-708 DEC 1997

Document type: Article Language: English [Cited References: 19](#) Times Cited: 0

**Abstract:**  
This experimental study extends prior studies to consider the influences of discharge polarity, current, relative humidity, air temperature, and wire diameter and material on ozone generation rate in two-stage, wire-plate indoor air cleaners. Promising methods of decreasing the quantity of ozone released into living and work spaces are identified. Use of positive corona discharge is imperative since ozone generation rates are nearly an order of magnitude higher with negative discharge. For a specific precipitator design, the most important parameter in predicting ozone generation rate is current level. Changes in temperature and relative humidity of the inlet air stream over the range of ambient conditions expected in typical homes have less impact. In the commercial air cleaner studied, a 40% reduction in current from 1.08 to 0.60 mA, reduces ozone generation rate by nearly 50% from 0.005 to 0.0025 mg s<sup>-1</sup>. This reduction in current reduces particle collection efficiency by 20%. An increase in relative humidity from 17 to 55% decreases ozone generation rate 17%. An increase in air temperature from 293 to 301K decreases ozone generation rate by 6%. Ozone production can be controlled by the selection of wire diameter and material. At a fixed voltage, use of 0.10 mm rather than 0.20 mm tungsten discharge wires reduces ozone generation rate by 40%. The accompanying reduction in current does not cause a reduction in collection efficiency as long as the voltage in the collection stage is held constant. The benefit of controlling ozone generation rate by selection of wire material is that the electrical characteristics of the air cleaner are not affected. With a positive corona discharge, ozone generation rate is decreased by 30% with copper wires and by 50% with silver wires as compared to the rate with standard tungsten.

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## Ozone Generation by Indoor, Electrostatic Air Cleaners

Kimberly J. Boelter and Jane H. Davidson\*

PARTICLE TECHNOLOGY LABORATORY, DEPARTMENT OF MECHANICAL ENGINEERING, UNIVERSITY OF MINNESOTA, MINNEAPOLIS, MN 55455

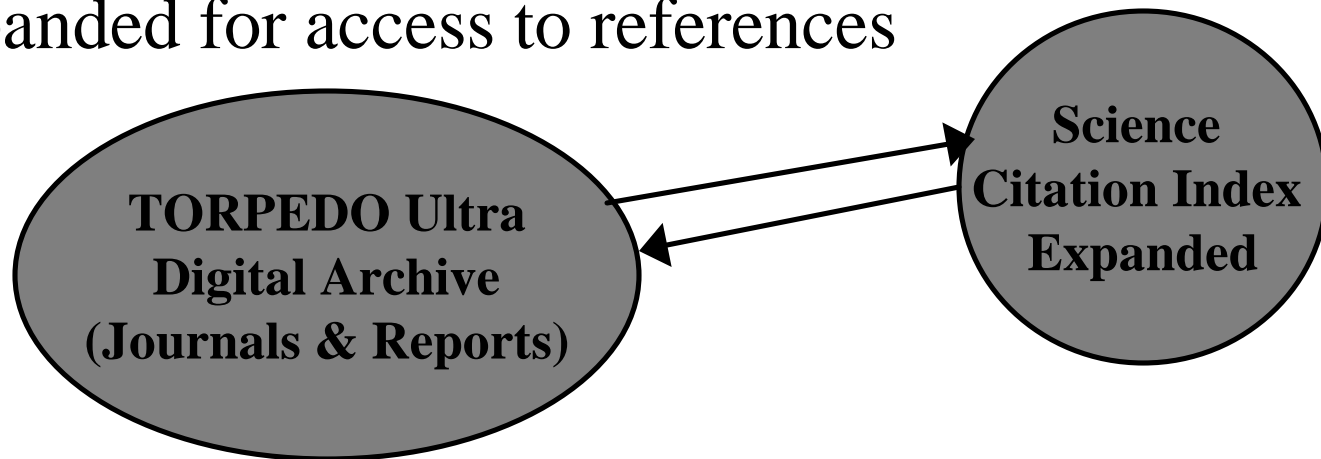
**ABSTRACT.** This experimental study extends prior studies to consider the influences of discharge polarity, current, relative humidity, air temperature, and wire diameter and material on ozone generation rate in two-stage, wire-plate indoor air cleaners. Promising methods of decreasing the quantity of ozone released into living and work spaces are identified. Use of positive corona discharge is imperative since ozone generation rates are nearly an order of magnitude higher with negative discharge. For a specific precipitator design, the most important parameter in predicting ozone generation rate is current level. Changes in temperature and relative humidity of the inlet air stream over the range of ambient conditions expected in typical homes have less impact. In the commercial air cleaner studied, a 40% reduction in current from 1.08 to 0.60 mA, reduces ozone generation rate by nearly 50% from 0.005 to 0.0025 mg s<sup>-1</sup>. This reduction in current reduces particle collection efficiency by 20%. An increase in relative humidity from 17 to 55% decreases ozone generation rate 17%. An increase in air temperature from 293 to 301K decreases ozone generation rate by 6%. Ozone production can be controlled by the selection of wire diameter and material. At a fixed voltage, use of 0.10 mm rather than 0.20 mm tungsten discharge wires reduces ozone generation rate by 40%. The accompanying reduction in current does not cause a reduction in collection efficiency as long as the voltage in the collection stage is held constant. The benefit of controlling ozone generation rate by selection of wire material is that the electrical characteristics of the air cleaner are not affected. With a positive corona discharge, ozone generation rate is decreased by 30% with copper wires and by 50% with silver wires as compared to the rate with standard tungsten wires. AEROSOL SCIENCE AND TECHNOLOGY 27:689-708 (1997) © 1997 American Association for Aerosol Research

Page 1 of 20 119% 6.51 x 10 in Document: Done

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- ISI-NRL Joint Project - Phases II and III

## Linking to Content of Article References

- Phase II: Add links from TORPEDO *Ultra* to article “summary” in Science Citation Index Expanded for access to references



- Phase III: Add links from Citation Index to journals residing on publisher Web sites

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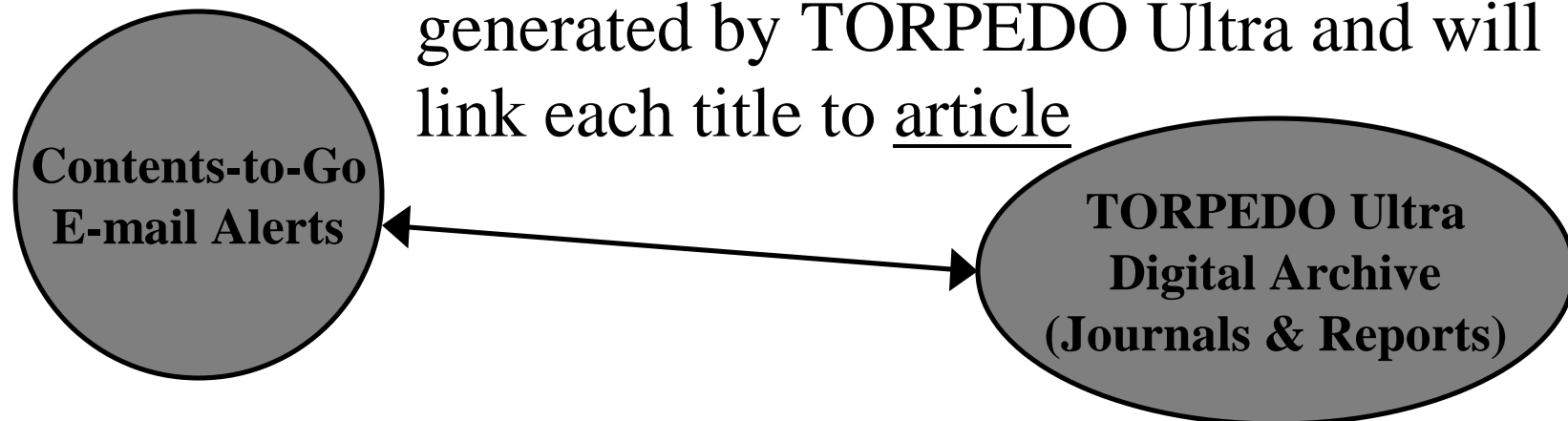
## An Automated E-mail TOC Alerting Service

- About half of Library's 1,000 journals are digital
- Contents-to-Go fills in the gap
  - E-mailed journal tables of contents
  - Article requests by reply e-mail
- Researchers use InfoWeb interface to request or cancel titles, entering preferred e-mail address
- Service is fully automated
  - Vendor e-mails data to Library mail server
  - Automatically redistributed to requesters



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• From Document *Delivery* to *Retrieval*  
Adding *Content* to Contents-to-Go

- For journals on publisher Web site, table of contents header provides URL link to site
- For journals in TORPEDO *Ultra*, table of contents header provides URL link to journal
- Future: tables of contents will be generated by TORPEDO Ultra and will link each title to article



Physical Review Letters - Message (HTML)

From: James King [jamesk@library.nrl.navy.mil] Sent: Tue 2/23/99 12:19 PM

**Physical Review Letters**  
**Volume: 81 (1998)**  
**Issue: 23 (Pages: 5039 - 5292)**

[Atomic Interference in Grazing Incidence Diffraction from an Evanescent Wave Mirror](#)  
**Authors:** L. Cognet; V. Savalli; G. Zs. K. Horvath; et al.  
 (Page 5044)

[Noise Enhanced Propagation](#)  
**Authors:** John F. Lindner; Sridhar Chandramouli; Adi R. Bulsara; et al.  
 (Page 5048)

[Study of the Solar Neutrino Survival Probability](#)  
**Authors:** C. M. Bhat; P. C. Bhat; M. Paterno; et al.  
 (Page 5056)

[Family Symmetry and Neutrino Mixing](#)  
**Authors:** John K. Elwood; Nikolaos Irges; Pierre Ramond  
 (Page 5064)

[Determination of the Weak Phase from Rate Measurements in B<sup>±</sup>K Decays](#)  
**Authors:** Matthias Neubert; Jonathan L. Rosner  
 (Page 5076)

[Dynamical Bloch Band Suppression in an Optical Lattice](#)  
**Authors:** K. W. Madison; M. C. Fischer; R. B. Diener; et al.  
 (Page 5093)

[Excess Quantum Noise Is Colored](#)  
**Authors:** A. M. van der Lee; M. P. van Exter; A. L. Mieremet; et al.  
 (Page 5121)

[Structure of Ge\(113\): Origin and Stability of Surface Self-Interstitials](#)  
**Authors:** A. Laracuente; S. C. Erwin; L. J. Whitman  
 (Page 5177)

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VOLUME 81, NUMBER 23 PHYSICAL REVIEW LETTERS 7 DECEMBER 1998

**Atomic Interference in Grazing Incidence Diffraction from an Evanescent Wave Mirror**  
 L. Cognet, V. Savalli, G. Zs. K. Horvath, D. Holleville,\* R. Marani, N. Westbrook, C. I. Westbrook, and A. Aspect  
*Laboratoire Charles Fabry\* de l'Institut d'Optique, BP 147, Orsay CEDEX 91403, France*  
 (Received 11 May 1998)

We report an experiment showing that atomic diffraction at grazing incidence from an evanescent wave mirror results from polarization gradients in the evanescent wave which induce transitions among atomic internal states. The resulting grating can produce large angle coherent beam splittings. We also demonstrate atomic interference in the form of a Stückelberg oscillation in the diffraction efficiency which is very sensitive to the atom wall van der Waals potential. [S0031-9007/98/07831-4]

PACS numbers: 03.75.Be, 01.75.Dg, 32.80.Lg

Diffraction at grazing incidence is an important phenomenon in which large period gratings can be used to deflect short wavelength beams through large angles (Fig. 1a). A striking demonstration of the effect occurs when a laser beam is incident on an ordinary ruler at grazing incidence. This is particularly useful in the field of x-ray optics [1] and neutron optics [2]. Similarly, atomic diffraction from a spatially modulated evanescent wave mirror at grazing incidence has also been under study for some time [3-7]. Following the first observations of this phenomenon [8,9], there has been some debate as to the physical mechanism responsible for diffraction because simple, two level models (which ignore light polarization and internal atomic structure) predict vanishingly small effects [6,7,10] at grazing incidence. This vanishing, due to the slow variation of the refracting potential in the direction normal to the surface on the scale of the de Broglie wavelength, contrasts to the typical optical case of a hard wall reflection grating and is analogous to the case of a thick grating. Through recent theoretical studies, however, a consensus has emerged that the interpretation of the observations of diffraction at grazing incidence must involve the internal atomic structure and polarization effects in the evanescent wave [11-13].

In this paper, we present the results of an experiment clearly demonstrating this. A simple physical model involving Landau-Zener transitions between ground state sublevels allows us to interpret the behavior of the diffraction efficiency. In particular, we observe Stückelberg oscillations, i.e., an interference between several atomic trajectories in the evanescent wave [11,13]. These oscillations are highly sensitive to the exact potential acting on the atoms and thus constitute a new technique for observing the van der Waals interaction between the atom and the dielectric surface supporting the evanescent wave.

Ordinary angle diffraction is the consequence of a resonance with diffraction from acoustic waves [15]. It can also be interpreted [7,16] as the impossibility of satisfying energy conservation in the time independent reflecting potential  $V(x, z) = V_0 \exp(-2xz) [1 + x \cos 2k_x x]$ , where  $x$  and  $k_x$  are the imaginary and real parts of the wave vector of the evanescent wave field. Because of energy conservation, the quantum  $\Delta p_x = \pm 2\hbar k_x$  of momentum transfer along  $x$  due to diffraction must be accompanied by a momentum change  $\Delta p_z = \pm 2\hbar k_z \tan i$  along  $z$ , where  $i$  is the angle of incidence (see Fig. 1a). The maximum normal momentum transfer, however, between the zeroth (specularly reflected) order and the diffracted orders is limited to approximately  $\hbar k$  because of the spatial extent  $\kappa^{-1}$  of the potential. At grazing incidence, where  $\tan i$  is large, one can satisfy energy conservation only by specular reflection.

To understand how polarization effects and internal structure allow one to overcome this impossibility, we consider an atom with two Zeeman ground states  $m_1$  and  $m_2$  bouncing on an evanescent wave far detuned above a resonance. A strong, TM polarized incident beam produces

(a) -1 order  
0 order  
+1 order  
frequency  $\omega/2\pi$   
TM  
TE  
 $\pi/2\pi$

(b) probe beam  
Absorption  
MOT

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## TORPEDO Digital Library Initiative

- Desktop access to full document content
  - Equations, formulas, graphs, and charts
- Web-based - user needs only network connection and graphical Web browser
- TORPEDO first went online in 1995
- Upgrade to TORPEDO *Ultra* in process

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## APS-NRL Journal Experiment

- 1994 Agreement between NRL and APS to test electronic dissemination of current journals - *Physical Review Letters* and *E*
- Process: unbound paper copies sent by overnight mail from publisher; scanned and OCRRed by Library
- Available to NRL users at their desktops within 24 hours through TORPEDO

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## APS-NRL CRADA- 1995

(Cooperative Research & Development Agreement)

- Investigation of search and retrieval systems for the display and printing of journal images and the use of the Internet as a transmission medium.
- By-Product: Page images of Physical Review series 1985-1995 produced by NRL
- All images are available through PROLA (Physical Review On-Line Archive)  
[PROLA URL <http://prola.aps.org/>]
- Most content also available through TORPEDO

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## TORPEDO *Ultra* Documents Online

- TORPEDO *Ultra* provides access to
  - 200+ Elsevier journals
  - 6 American Physical Society journals
  - 5,000 NRL Research Reports
  - 1,000 other Research Reports
  - 6,000 NRL-authored journal articles
  - 2,000 NRL Press Releases
- Coming soon
  - 17 American Institute of Physics journals

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## How TORPEDO *Ultra* Works

- TORPEDO *Ultra* offers two approaches to retrieval  
Journals can be **browsed** (like digital stacks)  
→ Journal → Volume → Issue → Article  
  
Or **searched** using a powerful COTS search engine  
(RetrievalWare by Excalibur Technologies)
- TORPEDO *Ultra* delivers text and page images  
TIFF-encapsulated PDF with bundled OCR  
Publisher-generated distilled PDF

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## TORPEDO *Ultra* PDF Content

- All TORPEDO *Ultra* PDF is
  - Bundled with text for searching
  - Optimized for byte serving for fast retrieval
  - Enhanced with thumbnails for document navigation
- Library gets PDF for TORPEDO *Ultra* by
  - Scanning and OCRing documents
  - Converting TIFF images to PDF
  - Obtaining PDF from publishers

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## RetrievalWare Search Software

- Field searching, e.g. author, title keywords, subject keywords, abstract
- Concept searching (find equivalent terms)
- Pattern searching (fuzzy-logic to find even those documents that have OCR errors)
- Boolean searching (and, or, with, near etc.)
- Search by example (find more like this one)
- Relevancy ranking

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## TORPEDO *Ultra* Hardware

### Production System

- Sun 4000 Enterprise Server
  - 8 CPUs; 2GB RAM; FastEthernet
- RAID Storage
  - Level 5; 1TB Online
- Tape Jukebox Backup
  - 3.5TB capacity; 8mm Mammoth Tapes

### Development System

- Sun Workstation 10

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- *What's So Great about Local Mounting?*

## Advantages of TORPEDO *Ultra*

NRL researchers benefit through

- Local access and high speed connectivity
- A single search interface for all materials
- Integrated information from associations, commercial publishers, and government
- Ensured access to locally maintained archive
- Links from other library databases and services
- Local control and customization to meet specialized requirements

# • *Challenges, Prospects, and Workarounds*

## The Library As Journal Aggregator

- Getting publishers to agree to local mounting
  - Can be time consuming (licensing, control issues)
  - May cost more (\$\$\$\$\$)
- Implementing access via a local system
  - Requires customized programming
  - May require data conversion
  - Ongoing and increasing storage requirements

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• *Challenges, Prospects, and Workarounds*  
The Library As Journal Aggregator

- Many major publishers allow local mounting
  - IEEE – Academic Press – Kluwer
- Other publishers prohibit local mounting
  - Institute of Physics – American Physical Society
- Rationale for prohibiting local mounting
  - Loss of control over copyrighted content
  - Enhancements seen as integral to digital product
    - Hyperlinks from references to cited article
    - Hyperlinks from article to subsequent citing article
    - Links to external databases and Web sites

# • *Challenges, Prospects, and Workarounds*

## The Library As Journal Aggregator

- So what's a Library to do?
- Objective: Make remote journals browsable and searchable along with locally mounted journals
- Potential NRL solution:
  - Add fielded and full-text indexing data for remote journals to TORPEDO Ultra
  - Retrieve article from publisher Web site by using appropriate URL as link
  - Provides end user with seamless browse and search of local and remote journals

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## Indexing Remote Journals: Approach #1

- Library indexing of remote journals requires publisher approval and cooperation
- American Physical Society experiment
  - Publisher delivers SGML data for indexing
  - Library
    - Extracts bibliographic data for browsing, field searching, and HTML display
    - Adds full text indexing data to TORPEDO Ultra
    - May archive SGML as backup but not for display

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## Indexing Remote Journals: Approach #2

- Alternative approach - not yet tested
- Publisher
  - Provides bibliographic data to library
  - Allows Library to index data from Web site using a “spider”
- Library
  - Uses bibliographic data for field searching and HTML display
  - Indexes full text for TORPEDO *Ultra* searching

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## Conclusion

- To enable NRL researchers to search across the electronic journals of many publishers
  - Journals are mounted locally in TORPEDO *Ultra*
  - Not all required journals can be made available
- In cooperation with association publisher, NRL is testing a promising, hybrid approach
  - Index journal contents locally (for searching)
  - Link to article on publisher Web site (for display)
- Result: Integrated access to local and remote electronic journals

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